

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Choi, et al.	Art Unit	: 1732
Serial No.	: 09/934,248	Examiner	: Mathieu D. Vargot
Filed	: August 21, 2001	Conf. No.	: 6502
Title	: FLEXURE BASED MACRO MOTION TRANSLATION STAGE		

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Commissioner for Patents
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APPEAL BRIEF

In response to the Office Action, dated February 21, 2008, Applicants hereby reinstate the appeal of the rejections of the claims.

I. REAL PARTY-IN-INTEREST

The real party in interest is The Board of Regents, The University of Texas System, who is the assignee of the entire right and interest in the present Application.

II. RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences known to Appellants, the Appellants' legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-3, 5-6, 8, 11-16, 31-32, 35, 37-42, 45-49, 212-221 and 223-225 are pending in the application and are rejected and appealed herein.

Claims 4, 7, 9-10, 17-30, 33-34, 36, 43-44, 50-211, 222 and 226 have been cancelled.

IV. STATUS OF AMENDMENTS

There were no amendments to the claims or Specification filed after the Final Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1 recites an apparatus for positioning of an object 1801 in at least one plane comprising a holding member configured to hold the object to be positioned, and a positioning system including a linkage 1805 coupled to the holding member, defining a first joint 1807 thereat, with said first joint being coupled to a second joint through a plurality of elongated members and a flexure joint, with said plurality of elongated members being coupled to said flexure joint to move at substantially the same rate and in opposite directions to facilitate movement of said holding member along first and second axes, with the first axis extending transversely to the second axis. See Fig. 18; Specification, p. 30, line 26 – p.31, line 11.

Claim 31 recites an apparatus for positioning of an object along a first axis and a second axis comprising a holding member configured to hold the object to be positioned, a platform coupled to the holding member, a first set of flexure linkages coupled to the platform, defining a plurality of first joints thereat, with each of said first joints being coupled to a second joint through a first pair of elongated members and a first flexure joint so as to facilitate movement of said first pair of elongated members in opposing directions while facilitating movement of said platform along a first axis, a second set of flexure linkages coupled to the platform, said second set of flexure linkages defining a plurality of third joints thereat, with each of said third joints being coupled to a fourth joint through a second pair of elongated members and a second flexure joint so as to facilitate movement of said second pair of elongated members in opposing directions while facilitating movement of said platform along a second axis; a first motive device coupled to the holding member, wherein the first motive device is configured to move the holding member in relation to the platform

along said first axis, and a second motive device coupled to the platform, wherein the second motive device is configured to move the platform along said second axis. See Figs. 16-17; Specification, p. 29, line 21 - p. 30, line 19.

Claim 212 recites an apparatus for positioning of an object in a plane, said apparatus comprising a holding member retaining said object, a linkage coupled to the holding member, defining a first joint thereat, with said first joint being coupled to ground through a plurality of elongated members and a flexure joint, and a motive device coupled to the holding member for moving the holding member, with said plurality of elongated members being coupled to said flexure joint to move in opposite directions to facilitate movement of said holding member along an axis in response to movement of said holding member by said motive device. See, Fig. 19; Specification, p. 31, line 13 - line 27.

VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 3, 38 and 219 stand rejected under 35 U.S.C. §112.
2. Claims 1-3, 5-6, 8, 11-16, 31-32, 35, 37-42, 45-49, 212-221 and 223-225 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *The Stewart Article* "A PLATFORM WITH SIX DEGREES OF FREEDOM" in view of the article to *Hogan* "Impedance Control: An Approach To Manipulation."

VII. ARGUMENTS

1. Applicants traverse the 35 U.S.C. §112 rejection of claims 3, 38 and 219 as failing to further limit the apparatus in a structural sense. There is no requirement that a claim dependent upon an apparatus claim structurally limit it further, though Applicants do not so admit that these claims do not provide structural limitations. Merely, Applicants assert the examiner's rejection is not a proper one under §112.

The pre-load is disclosed with respect to FIG. 19 and in paragraph [0147] of the published application. Therein it is disclosed that a pre-load may be applied between disks 1902 to prevent slipping. This is clearly a structural limitation.

2. In the Examiner's rejection under §103, the Examiner has pointed to Fig. 4 of *Stewart*, since this is the only figure that appears to show all of the features the Examiner has asserted are taught in *Stewart* as applied to the claims aforementioned. The Examiner has equated the platform in Fig. 4 of *Stewart* with the holding member recited in the claims. Further, the Examiner has equated the three-axis joint shown in Fig. 4 of *Stewart* with the flexure joint of the present invention. Yet still further, the Examiner has asserted that the second joint recited in the claims is taught by the two-axis joint in Fig. 4. Since Fig. 4 shows 2 two-axis joints, the Examiner is apparently referring to the one that is the furthest below in the figure, since the Examiner asserts that it is the joint that is "on the ground."

With respect to the teaching of *Hogan*, the Examiner refers to Figs. 2a and 3a, asserting that the first joint recited in the claims is coupled to a second joint, and that second joint is the joint that is connected at the wall in Fig. 2a. Applicants will thus assume that in Fig. 3a, the second joint is again the joint that is coupled to the wall in the figure.

CLAIM 1

Claim 1 recites a linkage coupled to the holding member defining a first joint thereat. Claim 1 then recites that the first joint is coupled to the second joint through a plurality of elongated members and a flexure joint. As noted above, the Examiner has asserted that the three-axis joint in Fig. 4 of *Stewart* reads on the flexure joint. This is where the Examiner's rejection breaks down and does not make logical sense. The Examiner has asserted that the three-axis joint in *Stewart* is the flexure joint. *Stewart* teaches that the three-axis joint is the joint connecting the platform to one of the linkages (see Fig. 4). However, Claim 1 recites that it is the first joint that couples the holding member to the linkage. Therefore, for *Stewart* to read on Claim 1, the three-axis joint would have to be equated with the first joint recited in the claim. (Note that Claim 1 recites that the coupling between the linkage and the holding member defines the first joint.) Moreover, the Examiner has not shown where in *Stewart* the first joint is located. Regardless of which of the two-axis joints in Fig. 4 of *Stewart* equates to the second joint recited in the claim, for *Stewart* to read on the

claim, the three-axis joint would have to be the first joint, and the one-axis joint would have to be the flexure joint. *Hogan* merely suggests, as the examiner has admitted, a first joint coupled to a second through a plurality of elongated members. This is merely cumulative to the disclosure of *Stewart*. At most, the combination of these references discloses a first joint coupled to a second joint through a plurality of elongated members and a non-flexure joint. Therefore, one skilled in the art at the time the invention was made would not have been able to recreate the invention as recited in Claim 1 in view of the combination of the *Stewart* and *Hogan* references.

Furthermore, the Examiner has intentionally misinterpreted the claim language in an attempt to prove that *Hogan* teaches such claim language. More specifically, in the rejection, the Examiner asserts: "*Hogan* (see Figs. 2a and 3a) shows . . . the first joint being coupled to a second joint (that against the wall in Fig 2a) through a plurality . . . of elongated members and another joint" (emphasis added). Notably, the Examiner has replaced the limitation recited in Claim 1 of "flexure" with the term "another." In the same sentence, the Examiner then goes on to state: "the plurality of elongated members being coupled to the another joint to move 'at substantially the same rate and in opposite directions to facilitate movement of the particular environmental interaction desired along first and second transverse axes" (emphasis added). Again, the Examiner has adulterated the interpretation of this claim language by replacing "flexure" with "another," and also replacing "holding member" with "particular environmental interaction." As a result, Applicants respectfully assert that the Examiner has interpreted the claims out of context in order to read the *Hogan* reference on these claims limitations. This is improper, and fails to show how all of the claim limitations in Claim 1 are taught or suggested by the combination of the references.

Moreover, the Examiner has not in any way shown how the combination of the references teaches or suggests the first joint being coupled to the second joint through a plurality elongated members and a flexure joint, with the plurality elongated members being coupled to the flexure joint to move at substantially the same rate and in opposite directions to facilitate movement of the holding member

along first and second axes. Applicants respectfully assert that they are not providing a piecemeal analysis of the Examiner's rejections or how the references are applied to the claims, since Applicants are attacking the specific assertions the Examiner has made in support of the rejections, particularly how the Examiner has specifically read the references on the claim language.

Yet still further, the Examiner has not in any manner whatsoever shown how either of the references, singularly or in combination, specifically teaches or suggests the claim language "at substantially the same rate and in opposite directions to facilitate movement of said holding member along first and second axes, with the first axis extending transversely to the second axis." Instead, the Examiner just cites this claim language and does not in any way point to any language within either *Stewart* or *Hogan* or their combination where such claim language is either taught or suggested.

As a result of the foregoing, it is quite clear that the Examiner has failed to prove a *prima facie* case of obviousness in rejecting Claim 1.

CLAIM 3

With respect to Claim 3, the Examiner essentially asserts that it is obvious to subject the plurality of the elongated members to a pre-load. However, the Examiner does not point to any language or figure in *Stewart* that supports his assertions. It is respectfully asserted that the Examiner cannot show a *prima facie* case of obviousness without support of objective evidence.

CLAIMS 5, 6

The examiner has ignored the limitations where the flexure joint is coupled to a pair of elongated members. For this reason alone, a *prima facie* case of obviousness fails. Further, since the examiner asserts the three-axis joint in *Stewart* teaches the flexure joint, it is impossible for *Stewart* and *Hogan* to show a pair of elongated members coupled to the flexure joint. Further, the examiner has not objectively shown how the references disclose that their devices can move through the recited ranges of motion. Not only do the references, singularly or in combination not teach or suggest a flexure joint allowing the elongated member shown in these two

references to rotate through such recited degrees of motion, but the fact that the Examiner failed to address results in the fact that the Examiner has failed to prove a *prima facie* case of obviousness, since the Examiner has failed to address all the limitations within these claims.

CLAIM 8

With respect to Claim 8, the rejection is inadequate for reason similarly given above with respect to Claim 1, since the Examiner has not properly shown how the references disclose these limitations with objective evidence. The examiner merely makes unsupported statements that the claims would be obvious.

CLAIM 12

Applicants traverse the examiner's assertion that magnetic servo motors are conventional in the art. Further, the examiner has not addressed the entire imitation by omitting to address that the servo motor is linear. Applicants respectfully assert that a magnetic linear servo motor could not be practically used to replace any hydraulic jacks in *Stewart*. *Stewart* would not work properly with such a substitution.

CLAIM 13

Claim 13 recites that the holding member comprises a wafer chuck. The Examiner has submitted that such a limitation is merely an intended use that the structure of the prior art would be inherently capable of performing. Applicants respectfully traverse such an assertion by the Examiner. Quite to the contrary, Claim 13 recites a structural limitation on the apparatus recited in Claim 1. The combination of the references does not in any way teach or suggest that the platform/holding member recited in *Stewart* could comprise a wafer chuck. *Hogan* does not disclose a wafer chuck either. *Stewart* teaches the mechanism for providing a flight simulator as being the discussed platform. In no logical manner whatsoever can such a flight simulator platform be equated to a wafer chuck. In fact, this is why the Examiner has made such an assertion that the limitation is an intended use, since the Examiner cannot in any way find another reference to combine with *Stewart* and *Hogan* where such other reference discloses a wafer chuck. The Examiner then goes on to admit that there is no disclosure within *Stewart* and *Hogan* of such a wafer

chuck, but that it would have been obvious that one skilled in the art at the time the invention was made could have used a combination of the teachings of the *Stewart* and *Hogan* mechanisms to provide such an apparatus for use with a wafer chuck by merely scaling down an apparatus taught by the combined references. Again, another completely unsupported assertion by the Examiner, which results in the Examiner failing to prove a *prima facie* case of obviousness.

CLAIM 14

Claim 14 is similar to Claim 13 except for that it recites that the holding member is configured to hold a semiconductor substrate. For reasons similarly given above with respect to Claim 13, Claim 14 is also patentable over the assertions by the Examiner and the combination of the prior art references.

CLAIM 15

Claim 15 recites wherein each of the elongated members of the plurality of elongated members has a common length. Note, the plurality of elongated members are recited in Claim 1 as coupling the first joint to the second joint in combination with the recited flexure joint. The Examiner asserts that *Hogan* shows such plurality of elongated members having a common length, pointing to Figs. 2a and 3a. However, it is clear that the plurality of elongated members in *Stewart* cannot be of a common length. In fact, *Stewart* teaches away from such a common length by showing that such elongated members are hydraulic jacks, which are required to constantly modify their respective lengths individually in order to move the platform along first and second axes. Therefore, a combination of the *Hogan* and *Stewart* references, which is required for the Examiner's *prima facie* case of obviousness, is not possible in order to meet this claim limitation, since the common length elongated members taught in *Hogan* cannot be utilized within the mechanism taught in *Stewart*.

CLAIM 16

Claim 16 recites that the linkage recited in Claim 1 is configured to minimize kinematic singularities. In rejecting this claim, the Examiner has again made an unsupported assertion that it would have been obvious to have a linkage that is configured to minimize kinematic singularities. The Applicants respectfully traverse

this assertion by the Examiner, since it is without any objective support whatsoever. An Examiner cannot make obviousness rejections of claim limitations based solely on his own subjective opinion.

CLAIM 31

In rejecting Claim 31, the Examiner has merely provided the following:

Instant Claim 31 is submitted to be obvious over the art applied generally for reasons of record already set forth. As already noted, first and second sets of flexure linkages is obvious over the references applied and surely first and second motive devices would also be obvious.

First of all, this is a wholly inadequate rejection of Claim 31, since it in no way specifically addresses all of the limitations recited therein. Claim 31 is not merely taking Claim 1 and appending an identical set of the Claim 1 limitations to a first set and then replacing the word "first" with "second." There are other limitations within Claim 31 that the Examiner has not specifically addressed. For this reason alone, the Examiner has failed to prove a *prima facie* case of obviousness in rejecting Claim 31. Secondly, Applicants respectfully assert that Claim 31 is patentable over the cited prior art for the same reasons that are given above with respect to Claim 1.

CLAIM 212

Likewise, with respect to Claim 212, the Examiner has merely asserted that "[i]nstant claim 212 is also considered to be obvious for reasons already advanced." As asserted by Applicants above with respect to Claim 31, this a wholly inadequate rejection of Claim 212, since the Examiner has not specifically addressed all of the claim limitations of Claim 212 in how they interact with each other. For this reason alone, the Examiner has failed to prove a *prima facie* case of obviousness in rejecting Claim 212. Secondly, Claim 212 is patentable for reasons similarly given above with respect to Claims 1 and 31.

CLAIMS 32 AND 214

Claims 32 and 214 are patentable for reasons similarly given above with respect to Claim 15.

CLAIM 35

Claim 35 is patentable for reasons similarly given above with respect to Claim 16.

CLAIMS 38 AND 219

Claims 38 and 219 are patentable for reasons similarly given above with respect to Claim 3.

CLAIMS 39-41 AND 217-218

For reasons as similarly given above with respect to Claims 5 and 6, Claims 39-41 and 217-218 are patentable.

CLAIM 42

Claim 42 is patentable for reasons similarly given above with respect to Claim 5.

CLAIMS 45-47 AND 223

These claims are patentable for reasons similarly given above with respect to Claim 12.

CLAIMS 48 AND 224

These claims are patentable for reasons similarly given above with respect to Claim 13.

CLAIMS 49 AND 225

These claims are patentable for reasons similarly given above with respect to Claim 14.

CLAIMS 213

Claim 213 is patentable for reasons similarly given above with respect to Claims 1, 8 and 212.

CLAIM 215

Claim 215 recites the apparatus of Claims 212 and 213 wherein the axis extends transversely to the additional axis. In order to reject this claim the Examiner has solely asserted that the six degrees of freedom imparted by the motion applied from in *Stewart* would allow for such transverse extensions of the axis. In response, Applicants respectfully traverse such an assertion by the Examiner, since it is again

an unsupported subjective opinion by the Examiner, without any reference to specific teachings or suggestions within either of the prior art references. The Examiner has again failed to prove a *prima facie* case of obviousness in rejecting Claim 215.

CLAIMS 220 AND 221

In rejecting Claims 220 and 221, the Examiner has merely stated that “the linkage of *Hogan* would allow the pair of elongated members to rotate at substantially the same rate away from each other as set forth in instant claims 220 and 221 for the first linkage and additional linkage.” Again, such an assertion by the Examiner is his subjective opinion, which is insufficient to support a *prima facie* case of obviousness in rejecting these two claims. The Examiner has not supported this assertion by pointing to any teachings within *Hogan*, *Stewart*, or the combination, to show how the combination of the references would disclose or even suggest these claim limitations. Again, the Examiner has failed to prove a *prima facie* case of obviousness in rejecting Claims 220 and 221.

CLAIM 37

Though the Examiner has listed Claim 37 on page 2 of the Office Action as being obvious in view of *Stewart* and *Hogan*, the Examiner has completely failed to address the limitations in Claim 37 in the body of the Examiner's assertions on pages 2-5. As a result, the Examiner has failed to prove a *prima facie* case of obviousness in rejecting Claim 37.

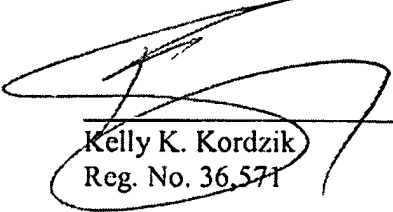
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Since Applicants are reinstating the appeal, no fees are due.

Respectfully submitted,

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CLAIMS APPENDIX

1. An apparatus for positioning of an object in at least one plane comprising:
a holding member configured to hold the object to be positioned; and
a positioning system including a linkage coupled to the holding member, defining a first joint thereat, with said first joint being coupled to a second joint through a plurality of elongated members and a flexure joint, with said plurality of elongated members being coupled to said flexure joint to move at substantially the same rate and in opposite directions to facilitate movement of said holding member along first and second axes, with the first axis extending transversely to the second axis.
2. The apparatus of claim 1 wherein said plurality of elongated members consists of a pair of elongated members.
3. The apparatus of claim 1 wherein each of said plurality of elongated members is subjected to a pre-load.
5. The apparatus of claim 1 wherein said plurality of elongated members consists of a pair of elongated members coupled to said flexure contact joint to allow rotation between said pair of elongated members through a predetermined range of motion.
6. The apparatus of claim 1 wherein said plurality of elongated members consists of a pair of elongated members coupled to said flexure joint to allow rotation between said pair of elongated members through at least a 40 degree range of motion.
8. The apparatus of claim 1 wherein said positioning system further includes an additional linkage having an additional plurality of elongated members and an additional flexure joint with an additional plurality of elongated members coupled to

said additional flexure joint to move at substantially the same rate in opposite directions.

11. The apparatus of claim 1, further comprising at least one motive device coupled to the holding member.

12. The apparatus of claim 1, further comprising at least one motive device coupled to the holding member, wherein each motive device comprises a magnetic linear servomotor.

13. The apparatus of claim 1, wherein the holding member comprises a wafer chuck.

14. The apparatus of claim 1, wherein the holding member is configured to hold a semiconductor substrate.

15. The apparatus of claim 1 wherein each of the elongated members of said plurality of elongated members has a common length.

16. The apparatus of claim 1 wherein said linkage is configured to minimize kinematic singularities.

31. An apparatus for positioning of an object along a first axis and a second axis comprising:

- a holding member configured to hold the object to be positioned;

- a platform coupled to the holding member;

- a first set of flexure linkages coupled to the platform, defining a plurality of first joints thereat, with each of said first joints being coupled to a second joint through a first pair of elongated members and a first flexure joint so as to facilitate movement of said first pair of elongated members in opposing directions while facilitating movement of said platform along a first axis;

a second set of flexure linkages coupled to the platform, said second set of flexure linkages defining a plurality of third joints thereat, with each of said third joints being coupled to a fourth joint through a second pair of elongated members and a second flexure joint so as to facilitate movement of said second pair of elongated members in opposing directions while facilitating movement of said platform along a second axis;

a first motive device coupled to the holding member, wherein the first motive device is configured to move the holding member in relation to the platform along said first axis; and

a second motive device coupled to the platform, wherein the second motive device is configured to move the platform along said second axis.

32. The apparatus of claim 31 wherein said first pair of elongated members has a first common length and said second pair of elongated members has a second common length.

35. The apparatus of claim 31 wherein said first and second linkages are each configured to minimize kinematic singularities.

37. The apparatus of claim 31 wherein said first axis extends transversely to said second axis.

38. The apparatus of claim 31 wherein said first and second pairs of elongated members are subjected to pre-loading.

39. The apparatus of claim 31, wherein said first pair of elongated members is coupled to said first flexure joint to allow rotation between said first pair of elongated members through at least a 20 degree range of motion.

40. The apparatus of claim 31 wherein said first pair of elongated members is coupled to said first flexure joint to allow rotation between said first pair of elongated members through at least a 40 degree range of motion.

41. The apparatus of claim 31 wherein said second pair of elongated members is coupled said second flexure joint to allow rotation between said second pair of elongated members through at least a 20 degree range of motion.

42. The apparatus of claim 31 wherein said second pair of elongated members is coupled to said second flexure joint to allow rotation between said second pair of elongated members through a predetermined range of motion.

45. The apparatus of claim 31, wherein the first motive device comprises a magnetic linear servomotor.

46. The apparatus of claim 31, wherein the second motive device comprises a magnetic linear servomotor.

47. The apparatus of claim 31, wherein the first and second motive devices comprise magnetic linear servomotors.

48. The apparatus of claim 31, wherein the holding member comprises a wafer chuck.

49. The apparatus of claim 31, wherein the holding member is configured to hold a semiconductor substrate.

212. An apparatus for positioning of an object in a plane, said apparatus comprising:
a holding member retaining said object;
a linkage coupled to the holding member, defining a first joint thereat, with said first joint being coupled to ground through a plurality of elongated members and a flexure joint; and
a motive device coupled to the holding member for moving the holding member, with said plurality of elongated members being coupled to said flexure joint to move in opposite directions to facilitate movement of said holding member along an axis in response to movement of said holding member by said motive device .
213. The apparatus of claim 212 further including an additional linkage coupled to the holding member and including an additional plurality of elongated members coupled to an additional flexure joint, with said additional plurality of elongated members coupled to said additional flexure joint to move in opposite directions to facilitate movement of said holding member along an additional axis.
214. The apparatus of claim 212 wherein each of said plurality of elongated members are of a common length.
215. The apparatus of claim 213 wherein said axis extends transversely to said additional axis.
216. The apparatus of claim 213 wherein said plurality of elongated members consists of a pair of elongated members and said additional plurality of elongated members consists of an additional pair of elongated members.
217. The apparatus of claim 216 wherein said linkage is configured to allow rotation between said pair of elongated members through at least a 20 degree range of motion and said additional linkage is configured to allow rotation between said additional pair of elongated members through at least a 20 degree range of motion.

218. The apparatus of claim 216 wherein said linkage is configured to allow rotation between said pair of elongated members through a 40 degree range of motion and said additional linkage is configured to allow rotation between said additional pair of elongated members through at least a 40 degree range of motion.

219. The apparatus of claim 216 wherein said pair of elongated members and said additional pair of elongated members are pre-load.

220. The apparatus of claim 216 wherein said linkage is configured to constrain the motion of said pair of elongated members to rotate at substantially the same rate away from one another.

221. The apparatus of claim 220 wherein said additional linkage is configured to constrain the motion of said additional pair of elongated members to rotate at substantially the same rate away from one another.

223. The apparatus of claim 212 wherein the motive device comprises a magnetic linear servomotor.

224. The apparatus of claim 212 wherein the holding member comprises a wafer chuck.

225. The apparatus of claim 212 wherein the holding member is configured to hold a semiconductor wafer.

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EVIDENCE APPENDIX

No evidence was submitted pursuant to §§1.130, 1.131, or 1.132 of 37 C.F.R. or of any other evidence entered by the Examiner and relied upon by Appellants in the Appeal.

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RELATED PROCEEDINGS APPENDIX

There are no related proceedings to the current proceeding.

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